PERFORMANCE SYSTEMS DEVELOPMENT

HERS Raters and Code Officials Working Together

It's Not All about the ERI

Presenters:
Mike Turns and Emelie Cuppernell

Performance Systems Development

2016 National RESNET Conference
March 2, 2016
Scottsdale, AZ

About PSD

Programs

- ✓ Design
- ✓ Implementation
- ✓ Marketing
- ✓ QA/QC

Professional Services

- ✓ Technical Consulting
- ✓ Training
- ✓ Energy Engineering
- ✓ Rater Providership

Software

- ✓ TREAT
- ✓ Field tools
- ✓ Program Management Applications
- ✓ M&V

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PERFORMANCE SYSTEMS DEVELOPMENT

Overview

- Energy code overview/Rater opportunities
- Education of and communication with code officials
- Providing the right documentation

Market Potential

- Homes receiving HERS Ratings in 2015:

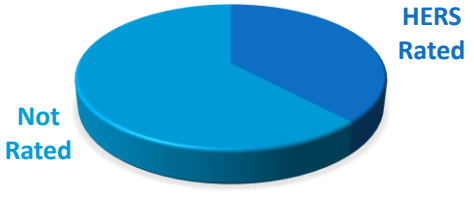
~190,000 (38%)

- Homes NOT receiving HERS Ratings:

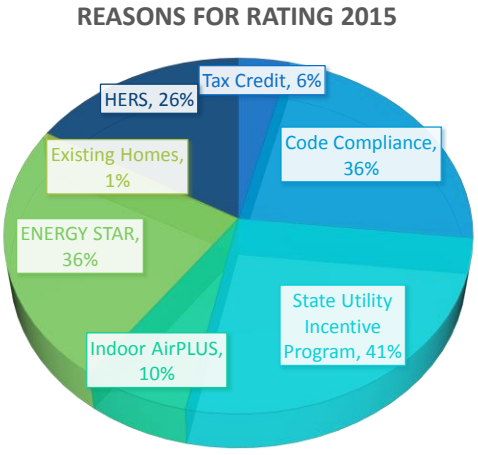
>500,000 (62%)

- Homes required to meet code:

690,000 (100%)



HERS Raters working with Code – PSD Experience



PSD Provider Coverage

- MA Stretch Code
- NY LI Stretch Code
- IECC 2009

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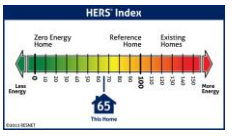
Code as a gateway to broaden your offering

Code can get you in the door…



Building science consulting/ comfort/ diagnostics

ZERO ENERGY READY HOME

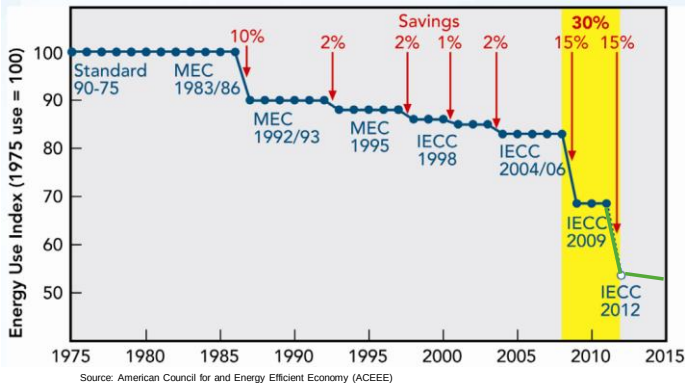
IRS Tax Credit

ENERGY STAR HOMES

EPA Indoor airPLUS QUALIFIED HOME

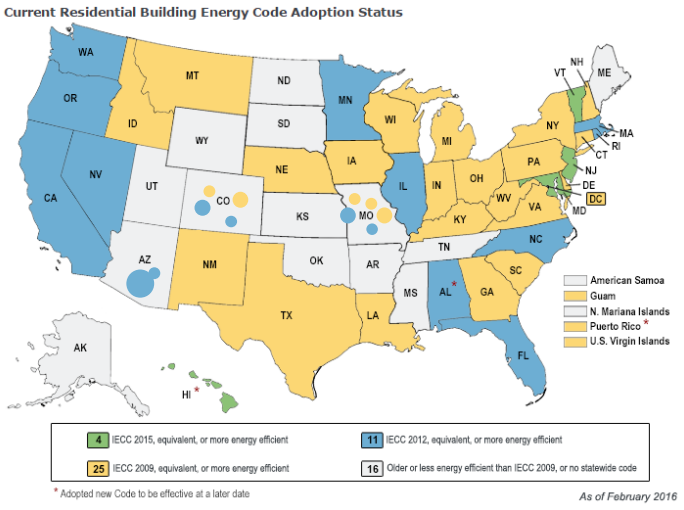
PHIUS Passive House Institute US

Overview of code progression with regard to Rater opportunities



Source: American Council for and Energy Efficient Economy (ACEEE)

Code Adoption Status by State



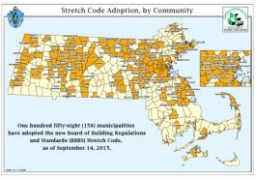
Performance-Related Code Requirements - Timeline

2006	2009	2012	2015
• Air sealing list • UA Tradeoff • Equipment sizing/select • Simulated Performance Alternative	• Above-code programs • UA Tradeoff • Equipment sizing/select • **Blower door test (optional)** • **Detailed air sealing and insulation inspection criteria** • **Duct testing** • **Simulated Performance Alternative**	• Above-code programs • UA Tradeoff • Equipment sizing/select • Blower door test **(mandatory)** • Detailed air sealing and insulation inspection criteria • Duct testing • Simulated Performance Alternative	• Above-code programs • UA Tradeoff • Equipment sizing/select • Blower door test (mandatory) • Detailed air sealing and insulation inspection criteria • Duct testing • Simulated Performance Alternative • **Energy Rating Index Path**

PERFORMANCE SYSTEMS DEVELOPMENT

What is a Stretch Code?

- A "stretch" or "reach" code allows progressive municipalities or jurisdictions to adopt more stringent energy codes within a larger jurisdiction
- Often similar to the next version of code
- ENERGY STAR, additional prescriptive requirements, HERS Index option
- Prep the market, drive savings, allow trade offs



Massachusetts and Long Island

- Some form of stretch: Colorado, Long Island, Massachusetts, California, Santa Fe New Mexico, Oregon
- MA and LI
  - require a HERS Rater and an Index threshold
- It's like the ERI before ERI was cool
- Both require the Rater and Code Official to interact
- Enforced by building permit and certificate of occupancy

Know Your State and Local Municipalities

- Statewide code vs. home rule
- Statewide amendments
- Local amendments
- Stretch codes

Phoenix e.g.

R102.1.2 RESNET Testing & Inspection Protocol. The Residential Energy Services Network (RESNET) Mortgage Industry National Home Energy Rating System Standards Protocol for third party testing and inspections, shall be deemed to meet the requirements of sections R402.4.1.1, R402.4.1.2 and R403.2.2, and shall meet the following conditions:

1. Third Party Testing and Inspections shall be completed by RESNET certified Raters or Rating Field Inspectors and shall be subject to RESNET Quality Assurance Field Review procedures.
2. Sampling in accordance with Chapter 6 of the RESNET Standards shall be performed by Raters or Rating Field Inspectors working under a RESNET Accredited Sampling Provider.
3. Third Party Testing is required for the following items:
   a. R402.4.1.1 –Building Envelope – Thermal and Air Barrier Checklist
   b. R402.4.1.2 –Testing – Air Leakage Rate
   c. R403.2.2 – Sealing – Duct Tightness
4. The other requirements identified as "mandatory" in Chapter 4 shall be met.
5. Alternate testing and inspection programs and protocols shall be allowed when approved by the Code Official.

R401.2.1 Alternative approach for compliance. A Home Energy Rating System ("HERS") Index of 73 or less, confirmed in writing by a Residential Energy Services Network certified energy rater may be used in place of the approach described in section 401.2 above. Compliance may be demonstrated by sampling in accordance with Chapter 6 of the Mortgage Industry National Home Energy Rating Systems Standard as adopted by the Residential Energy Services Network.

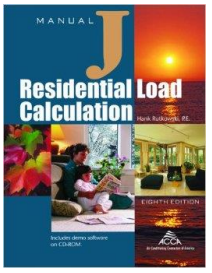
Know the Code - Above-code Programs

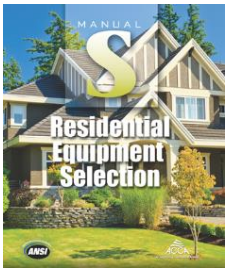
IECC 102.1.1. Above code programs.

- The code official shall be permitted to deem national, state or local energy efficiency program to exceed this code
- Buildings approved in writing by such a program shall be considered in compliance with this code
- "Mandatory" requirements shall be met

Know the Code – Equipment Sizing/Selection

- Equipment selected per Manual S, based on calculations performed using Manual J





Know the Code – Air Sealing Verification

- Building envelope air tightness and insulation installation shall be demonstrated by:
  - Blower door test
  - Visual inspection

  2009: One or the other
  2012: Both
  2015: Both

- Building official may require third party agency to conduct either blower door test, visual inspection or both

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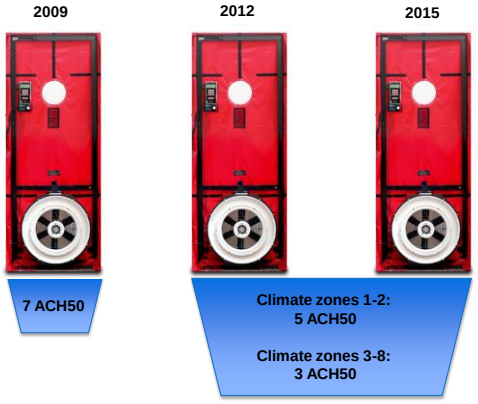
Know the Code – Building Envelope Leakage Limits



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Know the Code – Air Barrier and Insulation Inspections

TABLE 402.4.2
AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA

COMPONENT	CRITERIA
Air barrier and thermal barrier	Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. Breaks or joints Air-permeable Air-permeable
Ceiling/attic	Air barrier gaps are Attic access
Walls	Corners a Junction
Windows and doors	Space be
Rim joists	Rim joists are insulated and include an air barrier.
Floors (including above-garage and cantilevered floors)	Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of insulation.
Crawl space walls	Insulation is permanently attached to walls. Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or uncond
Narrow cavities	Batts in insulati
Garage separation	Air seal
Recessed lighting	Recesse Except
Plumbing and wiring	Insulati and plu
Shower/tub on exterior wall	Showe from the exterior wall.

Air barrier and thermal barrier	External envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier
Shower/tub on exterior wall	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall

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Know the Code – Air Barrier and Insulation Inspections

- **IECC 402.4.2.2.** Where required by the code official, **an approved party independent from the installer of the insulation** shall inspect the air barrier and insulation
- Discuss having the code office create a list of approved parties (i.e. you)

Know the Code – IECC Duct Leakage Verification

Maximum CFM25 per 100 sq. ft. conditioned floor area

	2009	2012	2015
Post-construction test			
Leakage to Outdoors	8	NA[1]	NA[1]
Total Leakage	12	4	4
Rough-in test			
Total Leakage	6	4	4
Total w/o air handler	4	3	3

[1]Leakage to outdoors option eliminated.

PERFORMANCE SYSTEMS DEVELOPMENT

REScheck

- Use building envelope tradeoffs to help builders find cost-effective solutions

2009 IECC Energy Efficiency Certificate

Insulation Rating	R-Value	
Ceiling / Roof	38.00	
Wall	19.00	
Floor / Foundation	30.00	
Ductwork (unconditioned spaces):	_____	
Glass & Door Rating	**U-Factor**	**SHGC**
Window	0.35	0.60
Door	0.23	NA
Heating & Cooling Equipment	**Efficiency**	
Heating System:_____	_____	
Cooling System:_____	_____	
Water Heater:_____	_____	

Name: _____ Date: _____

Comments:

Know the Code – Simulated Performance Alternative

- Compares the estimated annual energy cost of a proposed design to the standard reference design (similar to a rating)
  - Thermal envelope tradeoffs
  - Air tightness credit
  - Duct tightness and insulation credit

RESNET Accredited IECC Performance Verification Tools (not a code requirement)

Ekotrope, HERS Module v2.0
Ekotrope
Website: ekotrope.com
Date of Expiration: December 31, 2016

IC3 v4.01
Energy Systems Laboratory
Website: ic3.tamu.edu/
Date of Expiration: December 31, 2016

Right-Energy® IECC
Wrightsoft Corporation
Website: www.wrightsoft.com
Date of Expiration: December 31, 2016

EnergyGauge® USA V 5.0
Florida Solar Energy Center
Website: www.energygauge.com/usares
Date of Expiration: December 31, 2016

REM/Rate REM/Design 14.6.2
NORESCO
Website: www.remrate.com
Date of Expiration: December 31, 2016

Educating the Code Official

Raters and Code Officials – Mutual Respect

- HERS Raters are not Code Officials
- Code Officials are not HERS Raters
- Acknowledge this
- You are a resource for code officials
  - They see you as an energy expert, call you for advice
  - The code official is happy to have that
- The code official is a resource for you, and can be an advocate for you

Raters and Code Officials working together - Challenges

- Sometimes you will disagree about a requirement or standard
- The Code Official is the emperor of their own territory, what they say is right
- Don't challenge that
- It might be different than what another code official says a town over
- What Helps?
  - Ask "Can you tell me where that's written in the standards?" (MA)
  - Ask for their interpretation of a specific standard (PA)
  - Inform them of what you can do, or what you've seen done in other places (NY)
  - Get creds, and show them (They want a certificate or credential, HERS Rater, ICC verifier)

NYSERDA Trainings and DOE Codes

- IBTS/Cadmus/PSD pilots
  - 3 residential trainings/info gathering
    - Open to 3rd-party energy pros?
- Energy Code Field Study
- Code officials:
  - Were generally OK with concept
  - Want trusted credentials
  - Want standardized documentation

Potential Challenges

- The code official may see the rater as a threat, taking some of their job
  - This is rarely the case in our experience
  - The code officials are BUSY and are often not paid on a per inspection basis
  - They may not understand how to meet a criteria ("appropriate" certification or document)
- The code official may not want to deal with the HERS Rater
  - Let them know how you can help
  - They may have to deal with you anyway

Get to know the Code Official(s)

- Not all alike
- Be sensitive to job security/turf issues
- Top priorities: Life + health + safety
- Energy – Many site lack of time and resources
  - Raters can help

Educating the Code Official

- Have conversations with heads of building departments or an ally within the dept.
  - When are energy inspections and testing required, benefits, cost(?)
  - Refer to specific code sections
  - Show examples of documentation (ACH50, CFM25, inspection checklist, IECC performance report)
  - Lay groundwork for ERI Path

Street Cred

- Other ideas:
  - Attend energy code trainings in your area and network with code officials
  - Join your local ICC chapter and attend events
  - Give seminars for building department staff and ICC chapters

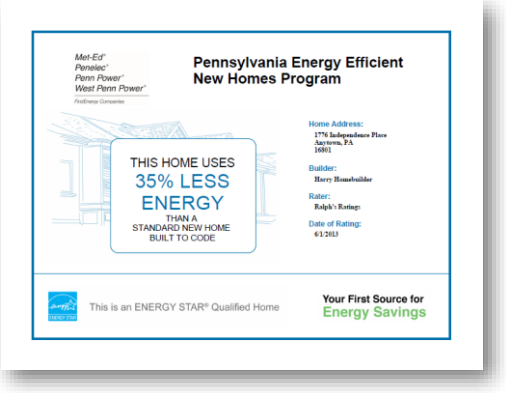
Providing the Right Documentation

Documentation

- What is the code official looking for?
  - Do they already have standard forms?
  - Any specific info not directly spelled out in the code?
- If they don't know, give them examples

Documentation – Above-Code Programs

- Certificate
- Signed checklist of "mandatory" items



IECC 2009 Label

2009 IECC Certificate

124 Rater Way, Herstown, PA 06053

Building Envelope Insulation		
Ceiling	NA	
Above Grade Walls	R-29.0	
Foundation Walls	NA	
Exposed Floor	NA	
Slab	R-10.0 Edge, R-0.0 Under	
Infiltration	Htg: 5.10 Clg: 5.10 ACH50	
Duct	NA	
Duct Leakage to Outside	32.00 CFM @ 25 Pascals	
Window Data	**U-Factor**	**SHGC**
Window	0.310	0.400
Mechanical Equipment		
HEAT: Fuel-fired air distribution, Natural gas, 96.5 AFUE.		
COOL: Air conditioner, Electric, 14.2 SEER.		
DHW: Conventional, Natural gas, 0.91 EF, 6.0 Gal, R-10 wrap.		
Builder or Design Professional		
Signature _____		

REM/Rate - Residential Energy Analysis and Rating Software v14.6.2.1

Home Energy Rating Certificate

Home Energy Rating Certificate

Property

Bary Better
124 Rater Way
Herstown, PA 06053

HERS
Rating Type: Confirmed
Rating Date: 1/22/2014
Registry ID:

Certified Energy Rater: Herby Rate
Rating Number:

HERS Index: 60

General Information

Conditioned Area	643 sq. ft.	House Type	Apartment, Inside unit
Conditioned Volume	5204 cubic ft.	Foundation	Slab
Bedrooms	1		

Mechanical Systems Features

Heating:	Fuel-fired air distribution, Natural gas, 96.5 AFUE.
Cooling:	Air conditioner, Electric, 14.2 SEER.
Water Heating:	Conventional, Natural gas, 0.91 EF, 6.0 Gal, R-10 wrap.
Duct Leakage to Outside	32.00 CFM25.
Ventilation System	Exhaust Only: 34 cfm, 3.8 watts.
Programmable Thermostat	Heat=No; Cool=No

Building Shell Features

Ceiling Flat	NA	Slab	R-10.0 Edge, R-0.0 Under
Sealed Attic	NA	Exposed Floor	NA
Vaulted Ceiling	NA	Window Type	U-Value: 0.310, SHGC: 0.400
Above Grade Walls	R-29.0	Infiltration Rate	Htg: 5.10 Clg: 5.10 ACH50
Foundation Walls	NA	Method	Blower door test

Lights and Appliance Features

Percent Interior Lighting	100.00	Range/Oven Fuel	Electric
Percent Garage Lighting	0.00	Clothes Dryer Fuel	Natural gas
Refrigerator (kWh/yr)	408	Clothes Dryer EF	2.67
Dishwasher Energy Factor	0.46	Ceiling Fan (cfm/Watt)	0.00

Estimated Annual Energy Cost

Use	MMBtu	Cost	Percent
Heating	3.0	$32	7%
Cooling	4.0	$32	7%
Hot Water	1.8	$36	8%
Lights/Appliances	11.4	$222	50%
Photovoltaics	-0.0	$-0	-0%
Service Charges		$120	27%
Total	20.2	$443	100%

Criteria

This home meets or exceeds the minimum criteria for the following:
2009 International Energy Conservation Code

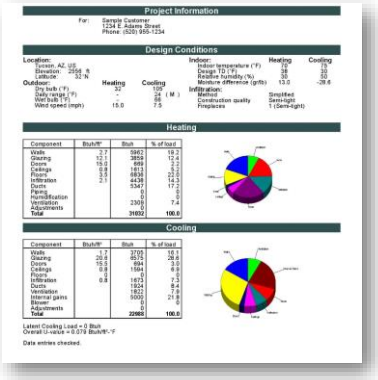
Performance Systems Development
124 Brindey Street
Ithaca, NY 14850

Certified Energy Rater: _____

REMRate - Residential Energy Analysis and Rating Software v14.6.2.1
This information does not constitute any warranty of energy cost or savings. © 1985-2015 Noresco, Boulder, Colorado.
The Home Energy Rating Standard Disclosure for this home is available from the rating provider.

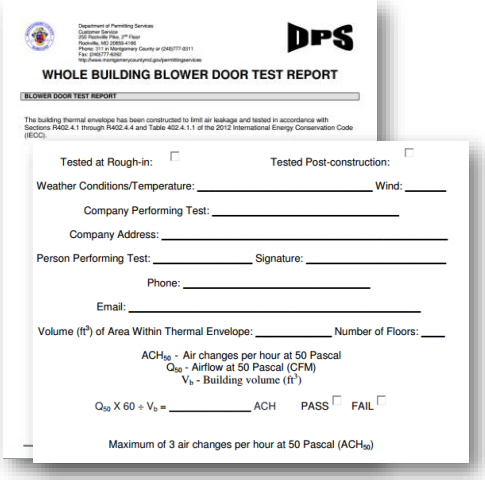
Documentation – Equipment Sizing/Selection

- Manual J and S reports



Documentation – Blower Door Testing

- Recommended data:
  - ACH50
  - CFM50
  - Conditioned volume
  - Pass
  - Name/signature



PERFORMANCE SYSTEMS DEVELOPMENT

Documentation – Air Barrier and Insulation Inspection

Air Barrier and Insulation Inspection Checklist (Table 402.4.2)

Component	Criteria	Complies	Does not Comply
Air barrier and thermal barrier	Exterior Thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier.	☐	☐
	Breaks or joints in the air barrier are filled or repaired.	☐	☐
	Air-permeable insulation is not used as a sealing material.	☐	☐
	Air-permeable insulation is inside of an air barrier.	☐	☐
Ceiling/attic	Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed.	☐	☐
	Attic access (except unvented attic), knee wall door, or drop down stair is sealed.	☐	☐
Walls	Corners and headers are insulated.	☐	☐
	Junction of foundation and sill plate is sealed.	☐	☐
Windows and doors	Space between window/door jams and framing is sealed.	☐	☐
Rim joists	Rim joists are insulated and include an air barrier.	☐	☐
Floors (including above-garage and cantilevered floors)	Insulation is installed to maintain permanent contact with underside of subfloor decking.	☐	☐
	Air barrier is installed at any exposed edge of insulation.	☐	☐
[Unvented] Crawl space walls	Insulation is permanently attached to walls.	☐	☐
	Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.	☐	☐
Shafts/penetrations	Duct shafts, utility penetrations, knee walls, and flue shafts opening to exterior or unconditioned space are sealed.	☐	☐
Narrow cavities	Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.	☐	☐
Garage separation	Air sealing is provided between the garage and conditioned spaces.	☐	☐
Recessed lighting	Recessed light fixtures are air tight, IC rated, and sealed to drywall. Exception- fixtures in conditioned space.	☐	☐
Plumbing and wiring	Insulation is placed between outside and pipes.	☐	☐
	Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.	☐	☐
Shower/tub on exterior wall	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.	☐	☐
Electrical/phone box on exterior wall	Air barrier extends behind boxes or air-sealed-type boxes are installed.	☐	☐
Common wall	Air barrier is installed in common wall between dwelling units.	☐	☐
HVAC register boots	HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.	☐	☐
Fireplace	Fireplace walls include an air barrier.	☐	☐

Name of inspector: _____ Signature: _____
Name of Company: _____ Rater #: _____

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Documentation – Duct Leakage

PUBLIC PROTECTION CABINET
Department of Housing, Buildings and Construction
Division of HVAC
101 Sea Hero Road, Suite 100
Frankfort, Kentucky 40601-5412
Phone: 502-573-0395, Fax: 502-573-1401
www.dhbc.ky.gov

Kentucky Residential Energy Code Duct Testing Results

Unless all ducts are located within conditioned space, one of the following must be verified (indicate one):

- ☐ Post-construction duct leakage to outdoors is ≤ 8 cfm per 100 ft^2 @ 25 Pa
- ☐ Post-construction total duct leakage is ≤ 12 cfm per 100 ft^2 @ 25 Pa
- ☐ Rough-in total duct leakage with air handler installed is ≤ 6 cfm per 100 ft^2 @ 25 Pa
- ☐ Rough-in total duct leakage without air handler installed is ≤ 4 cfm per 100 ft^2 @ 25 Pa

Square footage of conditioned floor area served by HVAC system: _____ ft^2

Test leakage measurement at 25 Pa: _____ cfm

Formula: cfm_{25} x 100 / ft^2 of conditioned floor area served = Duct Leakage Result

_____ cfm_{25} x 100 / _____ ft^2 of conditioned floor area served = _____ cfm leakage/100 ft^2

Kentucky
An Equal Opportunity Employer M/F/D

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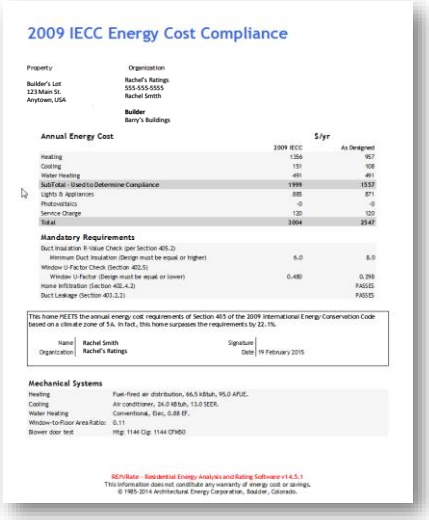
Documentation – Simulated Performance Alternative

- Certificate from software submitted with plans
- Plan review/inspection checklist
- Blower door and duct leakage results



2009 IECC Energy Cost Compliance

Property
Builder's Lot
123 Main St.
Anytown, USA

Organization
Rachel's Ratings
555-555-5555
Rachel Smith

Builder
Barry's Buildings

Annual Energy Cost — $/yr

	2009 IECC	As Designed
Heating	1356	957
Cooling	151	108
Water Heating	491	491
SubTotal - Used to Determine Compliance	1999	1557
Lights & Appliances	885	871
Photovoltaics	-0	-0
Service Charge	120	120
Total	3004	2547

Mandatory Requirements

Duct Insulation R-Value Check (per Section 405.2)		
Minimum Duct Insulation (Design must be equal or higher)	6.0	8.0
Window-U-Factor Check (Section 402.5)		
Window U-Factor (Design must be equal or lower)	0.480	0.298
Home Infiltration (Section 402.4.2)		PASSES
Duct Leakage (Section 403.2.2)		PASSES

This home MEETS the annual energy cost requirements of Section 405 of the 2009 International Energy Conservation Code based on a climate zone of 5A. In fact, this home surpasses the requirements by 22.1%.

Name: Rachel Smith — Signature:
Organization: Rachel's Ratings — Date: 19 February 2015

Mechanical Systems

Heating	Fuel-fired air distribution, 66.5 kBtuh, 95.0 AFUE.
Cooling	Air conditioner, 24.0 kBtuh, 13.0 SEER.
Water Heating	Conventional, Elec, 0.88 EF.
Window-to-Floor Area Ratio:	0.11
Blower door test	Htg: 1144 Clg: 1144 CFM50

REM/Rate - Residential Energy Analysis and Rating Software v14.5.1
This information does not constitute any warranty of energy cost or savings.
© 1985-2014 Architectural Energy Corporation, Boulder, Colorado.

Getting Energy Code Credentials

- Become certified via your state
  - This doesn't give you jurisdiction, just demonstrates knowledge and commitment
- Become an ICC-Certified Residential Energy Inspector/Plans Examiner (79)
  - Buy a code book (also available online)
  - Study the code
  - Pass the ICC Certification Exam (2 hours)
  - Continuing education (15 hours per 3 years)
- Get approved as a continuing education provider in your state
- Work with local ICC Chapters who are ICC Preferred Providers

Summary

Summary

- Not all builders ready to be EnergySmart builders
- All homes must meet the energy code
- Raters have skills to provide energy code consulting and verification
- Know the code
- Know the code official
- Educate the code official
- Get out there and market your skills/services